OPERATIONS AND ENGINEERING DIVISION

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Organization and Mission

The Operations and Engineering Division (OED) has three sections: Operations, which is led by Richard Heese; Electrical Systems, led by Richard Biscardi; and Mechanical Engineering, led by Ed Haas. To serve the NSLS User community, our mission falls into three main areas:

- Operation of the NSLS 24 hours a day, 7 days a week, on average 44 weeks a year
- Design, fabrication, and maintenance of the NSLS accelerators, infrastructure, and instru ments, including upgrades, modifications, and proposal development
- Engineering and technical support for other NSLS divisions and the NSLS user community

The OED staff includes one scientist, 17 engineers, and 53 technicians, making it the largest of the NSLS divisions. In addition to its own staff, the division coordinates the activities of five full-time skilled tradesmen from the Laboratory, as well as shops and trades assigned for specific jobs. The breadth of our mission requires us to draw on the capabilities of the other NSLS divisions for support, and in turn, provide specialized support for their activities.

2006 Activities

An overview of machine performance summarized for calendar year 2006 is provided in Section 5, “Facility Facts and Figures.” For Fiscal Year 2006, which is the DOE reporting period, overall reliability was 94% for the X-ray ring and 97% for the VUV ring. As in previous years, a comparatively small number of disruptions longer than four hours in duration account for much of the down time. For

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FY06 Summary Fault Analysis

Group / Area/System	Number of Faults Total	X- DT	U- DT	Downtime [hr] X-ray	UV
Total Charges to Down Time					
Controls and Diagnostics	140	44	5	61.6	6.9
Power Systems	235	112	27	139.8	74.0
Utilities	80	36	30	53.3	95.1
Miscellaneous	64	42	5	35.7	4.7
	519	234	67	290.3	180.7
Significant Disruptions					
VUV Transport line shutter					67.2
Modulator 3 Core Bias				54.1	48.7
XRF Micro				20.2	
Electron Gun Replacement					15.3
LBQ9 Short				11.5	4.2
BXESH1				6.8	
Modulator 3 Thyratron Replacement				6.7	
Water Fitting fail at X18/19 Sawtooth				6.1	6.5
XRF 2B 3 kW Amplifier				5.6	
UV Trim Micro					5.6
X1 Active Interlock PS				5.1	
X25 MGU Cooling				5.1	
UV Interlock Security System					4.4
X29 Active Interlock				4.3	
X13/14 Water Interlock				4.1	
URF Interlocks					4.0
				129.5	155.8
Balance to 'Routine' Faults					
				160.8	24.9

FY 2006, almost half of the x-ray downtime came from only 11 events, and on the UV ring, only eight faults accounted for more than 80% of the down time. This distribution is a continuing indication of an effective maintenance program in action; the majority of the faults are small and quickly recoverable and many potential “big” events are avoided through preventative maintenance.

The single largest down-time event in 2006 was the failure of the bellows on the UV transport line shutter. The shutter assembly is actually welded into the transport line, so the decision was made to replace the failed actuator without removing the shutter housing. This is not as easy as it sounds because of mechanical interferences, but the innovative approach that made it possible kept the down time to less than three days, from failure to return to operations. On the one hand, it is heartening that the institutional knowledge and creativity are still there to respond so effectively to a problem of this kind. A “traditional” repair, which would have cut out the shutter and welded in the spare, could have resulted in more than a week of down time. However, it is a concern that we may be beginning to see more “age-related” failures in NSLS equipment.

The NSLS has an aggressive preventive maintenance program, which has been effective in mitigating the effects of normal "wear and tear" on machine down time. The system stewards have also identified elements of the machine operations where failures are deemed to be most likely or to have the greatest impact. In those cases, plans for spares, upgrades, or replacements have been developed. To help validate the planning assumptions, a Machine Operations Reliability Evaluation (MORE) was held in 2006. This review was conducted by an external committee that was charged to evaluate our allocation of resources and plans to secure reliable operations to the 2012 to 2014 time frame.

Overall, the committee gave kudos to the NSLS staff members and their contributions to delivering high levels of machine availability and performance, and found that "the analysis of machine support and development needs is very good and that the mechanisms for project planning and prioritization are in place and appear to be effective." However, the committee also expressed the same kinds of concerns raised by the staff regarding threats to continued reliable operations. These included:

- Aging instrumentation, components, and infra structure
- The possibility of a major breach in security and/or safety
- A flat budget in out years
- Staff recruiting, retention, and knowledge transfer.

The committee also noted that staffing is a critical concern with the ramp-up of NSLS-II. These issues are being factored into the near-term planning for the facility as are the initiatives outlined in the NSLS Five Year Plan.

One of the new initiatives described in the plan is the construction of a new insertion device beamline at X9. As noted in the 2005 Activity Report, initial preparations for this construction began at the end of 2005. During 2006, the move of the Case Center for Synchrotron Biosciences beamlines from X9 to X3 was successfully completed. Preparations are underway for the construction and installation of the new insertion device-based Small Angle X-ray Scattering (SAXS) beamline to support research for the Center for Functional Nanomaterials. During the winter 2006 shutdown, the original "phase I" storage ring vacuum chamber for the X9/10 dipole and all of the old X9 bending magnet front-end components were removed. A new dipole vacuum chamber with a zero-degree output port compatible with the new X9 insertion device was installed. The design of a new Mini-Gap Undulator (MGU) and new front-end components compatible with the X9 MGU started in FY06 and will continue into FY07.

The old phase I chamber removed during the winter shutdown, and the chamber that replaced it being prepared in the lab prior to its installation.

Fabrication efforts for many components of the new X9 MGU insertion device have already begun, as has layout and fabrication of the new hutch for X9 (the largest ever at the NSLS!). During 2007, beamline design is to be completed, and the installation of the front end and insertion device are planned for the winter 2007 shutdown.

With many years of NSLS operations ahead, continuous maintenance and upgrades of the facility will be vital to ensure that a robust research community is ready to exploit the exciting new capabilities of NSLS-II when it comes online. The OED will continue its work to advance the initiatives in the NSLS strategic plan to keep our user community one of the most productive anywhere.